AbstractID: 9330 Title: Predictive capabilities of thermal damage model for real time MR monitored interstitial laser treatment in a canine brain model

Purpose: A suitable dose predictive capability will improve treatment success of interstitial laser treatment for brain tumors. This study compares the estimation of – Arrhenius damage prediction model (> 1) with the tissue damage measurements from T1 (post-contrast), T2 and FLAIR images. **Method and Materials:** Craniotomy holes were created in adult hound dogs (n=4). Imaging was performed on a 1.5T whole body MR scanner (EXCITE HD, GE Healthcare) .Under imaging guidance, a 1-cm diffusing tip laser (980nm, Biotex, Inc, Houston, TX) was used to deliver therapy. A temperature sensitive echo-planar sequence was used for real-time monitoring. Applied power was modulated between 6-15W (power times 30-100 seconds), to create ~1.5cm diameter lesions. Post-ablation MR assessment was with T1-weighted and T2-weighted (with and without FLAIR) sequences. Tissue measurements were made on the vendor supplied workstation (Advantage Windows version 4.1, GE Healthcare). The temperature images were processed and the damage estimation was done, using MATLAB software (Mathworks Inc. MA). Pearson's correlation coefficient and Bland Altman analysis was estimated with SPSS statistical software. **Results:** The correlation between the damage estimations and T2 measurements was weak *R*: 0.34 (pval 0.34), moderate with FLAIR *R*: 0.79 (pval 0.05) and significant with T1 measurements *R*: 0.87 (pval <0.001). The Bland-Altman analysis demonstrated fair agreement was between T1 and Arrhenius method. **Conclusion:** The study demonstrated that thermal damage estimated by Arrhenius damage prediction model correlated significantly with the post-DCE T1 images, while it was weak to moderate with the T2 and FLAIR areas. Fair agreement was noted between Arrhenius and T1. A reproducible estimation of brain damage will aid the translation of laser ablation from the research setting into the clinical realm.